

**Introduction:** One of the difficult aspects in analyzing redistricting plans is that the rules that are supposed to determine the properties of a good plan are often in conflict. This is particularly true when a single plan must be selected from a finite collection of proposed plans, since on many metrics the plans might vary in strength.

**Goal(s):** Build intuition for the ways that districting criteria interact. Understand the limits of mathematics in application to this social problem.

**Activity:** Below are several tables of values for plans that were considered in redistricting litigation in Wisconsin in 2021. Consider the values presented in the tables to determine which map ‘should’ be selected. Try to consider how you might argue (and how you might support your argument with quantitative reasoning) for your chosen map.

**Discussion Questions:** After you’ve looked at the tables and picked your favorite map, use the following questions to reflect on this exercise (we’ll also discuss them together in a little bit):

1. Which metrics seemed most important? Are there additional metrics you would like to evaluate?
2. Did the range of values on the metric influence your decision?
3. Which plan did you select/discard first? Why?
4. Is the plan you picked the ‘fairest’ one?
5. What choices might the expert have made to influence the outcome?

**Plan Data:**

Plan Name	BEWLEY	BLOC	CMS	GOV	HUNTER	SB621	WI-ENACTED
Maximum Deviation	1281	802	428	1112	845	520	22874
Maximum Deviation (%)	0.718	0.449	0.24	0.623	0.473	0.291	12.808
Minimum Deviation	-1590	-917	-467	-1026	-853	-506	-16529
Minimum Deviation (%)	-0.89	-0.513	-0.261	-0.574	-0.477	-0.283	-9.255
Min to Max	2871	1719	895	2138	1698	1026	39403
Min to Max (%)	1.608	0.962	0.501	1.197	0.951	0.574	22.062

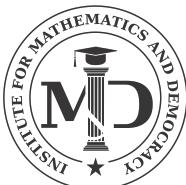
Table 1: Population deviations for proposed Senate maps

Plan Name	BEWLEY	BLOC	CMS	GOV	HUNTER	SB621	WI-ENACTED
.85	16	16	18	16	17	15	17
.9	14	13	14	15	15	14	16
.95	13	13	13	12	13	12	14
Preserved COIs	7	7	5	9	9	9	6

Table 2: Community of interest analysis of proposed Senate maps.

Plan Name	BEWLEY	BLOC	CMS	GOV	HUNTER	SB621	WI-ENACTED
BVAP Opportunity	2	2	2	2	2	2	2

Table 3: VRA performance of proposed Senate maps



Plan Name	BEWLEY	BLOC	CMS	GOV	HUNTER	SB621	WI-ENACTED
<i>Split Wards</i>	161 (0)	65	0	179	132	0	0
<i>Ward Pieces</i>	326 (0)	130	0	362	271	0	0
<i>Pop Split Wards</i>	165 (0)	65	0	183	139	0	0
<i>Split Counties</i>	48	42	28	45	42	42	46
<i>County Pieces</i>	138	128	86	136	116	115	130
<i>Pop Split Counties</i>	48	42	27	45	42	42	46
<i>Pop Split County Pieces</i>	77	73	45	78	61	60	71
<i>Split Muni</i>	67 (52)	73	31	117	109	28	84
<i>Muni Pieces</i>	146	157	69	252	234	62	180
<i>Pop Split Munis</i>	67	73	31	117	109	28	84
<i>Pop Split Muni Pieces</i>	75	80	34	131	121	30	92

Table 4: Political boundary preservation in proposed Senate maps.

Plan Name	BEWLEY	BLOC	CMS	GOV	HUNTER	SB621	WI-ENACTED
Min Polsby-Popper	0.078	0.067	0.071	0.053	0.085	0.048	0.053
Mean Polsby-Popper	0.213	0.197	0.260	0.217	0.268	0.224	0.230
Min Reock	0.137	0.127	0.140	0.135	0.141	0.133	0.128
Mean Reock	0.401	0.395	0.402	0.392	0.397	0.395	0.402
Min Convex Hull Ratio	0.492	0.486	0.508	0.480	0.470	0.466	0.483
Mean Convex Hull Ratio	0.717	0.695	0.735	0.710	0.739	0.710	0.723
Max Perimeter	4528072	5038075	4796424	4894066	4732978	4791440	4897792
Min Perimeter	158658	135732	169993	146844	161011	171471	142287
Mean Perimeter	45723837	48701600	43966747	46294574	42595246	45539837	46419630
Cut Edges	10688	11776	9754	11147	9565	10785	10928

Table 5: Compactness in proposed Senate maps.

Plan Name	BEWLEY	BLOC	CMS	GOV	HUNTER	SB621
<i>Core Population Moved</i>	576321	610568	1513824	461228	1128878	459061
<i>Percent Population Moved</i>	9.8 (9.5)	10.4	25.7	7.8	19.2	7.8
<i>Percent Area Moved</i>	9.8	6.1	29.1	5.0	14.0	7.1
<i>Average Buffer Distance</i>	6.7	6.2	17.0	5.4	8.5	6.5
County Overlap	33	33	33	33	33	33
District Overlap	33	33	33	33	33	33
Preserved Cut Edges	5791	6925	5512	7420	4575	6871
Preserved Internal Edges	476575	476621	477230	477745	476482	477558
<i>Odd to Even Population</i>	137084	177698	422492	139677	240593	138753
<i>Percent</i>	2.3	3	7.2	2.4	4.1	2.4

Table 6: Least change metrics of proposed Senate maps

